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ABSTRACT

Data from 1976 New Hampshire birth certificates were used to examine the correlations between the degree (month of pregnancy that prenatal care began) and intensity (number of prenatal visits) of prenatal care and low infant birth weight, illegitimacy, maternal age, maternal education, and complications of pregnancy. The rate of low birth weight infants was found to be significantly higher for those mothers who waited until the second trimester of pregnancy before getting prenatal care and for those mothers who had had 8 prenatal visits or less. Mothers who were 19 years of age or younger, had less than 12 years of education, and were giving birth out-of-wedlock tended to initiate their prenatal care later in their term of pregnancy. Younger, less educated mothers who had low birth weight infants or who gave birth out-of-wedlock also tended to have had fewer prenatal visits. Fewer prenatal visits was shown to be correlated with more complications of pregnancy. Early onset of prenatal care was found to be weakly correlated with fewer complications of pregnancy. (JMB)

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PRENATAL CARE
NEW HAMPSHIRE RESIDENTS - 1976

The major emphasis of this report concerns itself with the degree (month prenatal care began)* and intensity (number of prenatal visits) of prenatal care correlated to selected characteristics as shown in Tables One and Two. A latter portion of this report will deal with the month prenatal care began and the number of prenatal visits correlated to complications of pregnancy. The data, in the form of punch cards, were extracted from birth certificates at the Bureau of Vital Records and Health Statistics.

The overall degree and intensity of prenatal care is depicted by Figures One and Two of this report. The histogram shown in Figure One describes the percent distribution of live births by month prenatal care began. Note that the third month is the median month when prenatal care began. The bar graph shown in Figure Two describes the percent distribution of live births by number of prenatal visits. The median number of visits for New Hampshire residents is 10.6. The overall illustration is a favorable one. However, before any inferences can be made, a closer analysis is merited. One piece of the overall illustration which needs examination is the incidence of low birth weight. **

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The rate of low birth weight infants is significantly higher for those mothers waiting until the second trimester of pregnancy, before getting prenatal care. Of those mothers receiving prenatal care in the first trimester of their pregnancy, 5.9 percent of their live births were of low birth weight. For mothers receiving prenatal care after the first trimester, 7.2 percent of their live births were of low birth weight. This difference is significant at P.05; i.e., the probability of this occurring by chance alone is 5 in 100. This difference was even more profound when comparing the actual number of prenatal visits, which is also a function of the month prenatal care began. For mothers having eight visits or less, 14.6 percent of their births were of low birth weight; while for those mothers having more than eight visits, only 3.9 percent of their births were of low birth weight. The significance of this difference exceeds P.001; i.e., the probability of this occurring by chance alone is less than 1 in 1,000.

* *Month prenatal care began is synonymous with month of pregnancy prenatal care began.*

** *Low birth weight is defined as a baby weighing less than 5½ pounds (<2500 grams).*

MONTH PRENATAL CARE BEGAN BY SELECTED CHARACTERISTICS
NEW HAMPSHIRE RESIDENTS - 1976
(Numbers represent percentages of live births for specified month)

MONTH PRENATAL CARE BEGAN	% LOW BIRTH WT. <2500g	% ILLEG.	% MATERNAL AGE ≤18	≤19	% MATERNAL EDUC. <12	>12
First	8.4%	4.2%	3.4%	8.0%	16.1%	37.5%
Second	5.2	4.5	4.3	7.9	16.1	36.5
Third	6.1	7.4	8.0	14.0	20.6	32.7
Fourth	6.3	13.9	15.9	22.6	29.8	26.2
Fifth	9.7	21.0	21.8	29.0	37.1	20.2
Sixth	4.0	28.4	28.0	36.0	44.0	20.0
Seventh	8.9	33.6	30.8	40.4	52.7	17.8
Eighth	6.7	36.7	23.3	33.3	45.0	15.0
Ninth	13.2	36.8	15.8	28.9	26.3	34.2
No Prenatal Care	25.0	50.0	25.0	40.6	56.3	9.4
r with Mo.prenatal care began	*+.445*	*+.980*	*+.748*	*+.856*	*+.700*	*-.596*

*r = coefficient of correlation - the closer r is to +1 or -1 the stronger the linear relationship. The correlation coefficient is a measure of the mutual relationship between two variables.***

In the above chart the association between how soon prenatal care is initiated and low birth weight, illegitimacy, maternal age and maternal education is depicted. Mothers who were younger, had less education and were giving birth out-of-wedlock tended to initiate their prenatal care later in their term of pregnancy.

The strongest degree of association is between the month prenatal care began and the percent of live births that were illegitimate (r = +.980). This shows that women with illegitimate births tended to start their prenatal care very late in their pregnancy. The next strongest association is between the month prenatal care began and the percent of mothers nineteen years of age or younger (r = +.856). Women in this category tended to start their prenatal care later in their pregnancy. The correlation between the month prenatal care began and the percent of mothers with less than twelve years of education is stronger than the correlation for mothers with more than twelve years of education. The relationship between the month prenatal care began and the percentage of mothers with any college discipline (Educ. > 12) is inverse, that is, mothers with over twelve years of education tended to start their prenatal care earlier.

** *Refer to Appendix A for a clearer interpretation of the nature of r.*

The correlation coefficient is stronger for low birth weight, maternal age, and maternal education when analyzing the number of prenatal visits as opposed to the month these visits were started. There is an inverse relationship for all characteristics except for mothers who had more than twelve years of education. That is, mothers who had less than twelve years of education, were nineteen years of age or younger, had a low birth weight infant, or who gave birth out-of-wedlock tended to have a fewer number of prenatal visits; while mothers with more than twelve years of education tended to have a greater number of prenatal visits. A strong correlation is observed for the relationship between the number of prenatal visits and maternal education greater than twelve years ($r = +.900$). A strong correlation is also observed for the relationship between the number of prenatal visits and the percentage of low birth weight infants ($r = -.870$) and for the relationship between the number of prenatal visits and the percentage of mothers nineteen years of age or younger ($r = -.923$).

NUMBER OF PRENATAL VISITS BY SELECTED CHARACTERISTICS
NEW HAMPSHIRE RESIDENTS - 1976
(Numbers represent percentages of live births for specified number of visits)

NO. PRENATAL VISITS	% LOW BIRTH WT. <2500g	% ILLEG.	% MATERNAL AGE ≤18	% MATERNAL AGE ≤19	% MATERNAL EDUC. <12	% MATERNAL EDUC. >12
None	25.0%	50.0%	25.0%	40.6%	56.3%	9.4%
1	23.3	53.3	26.7	36.7	50.0	10.0
2	21.3	21.3	12.8	25.5	38.3	23.4
3	19.8	25.0	26.0	36.5	43.8	11.5
4	29.3	30.1	17.1	25.2	43.9	17.1
5	23.7	25.6	20.5	27.0	42.8	19.5
6	13.2	17.6	19.3	27.2	36.4	19.6
7	13.7	12.4	14.1	20.2	29.2	30.3
8	10.0	9.7	11.1	16.2	23.1	28.3
9	7.1	9.0	8.8	15.8	22.6	31.0
10 & over	3.5	6.0	6.2	10.7	17.9	35.7
r with No. prenatal visits	*-.870*	*-.872*	*-.827*	*-.923*	*-.943*	*+.900*

r = correlation coefficient - the closer r is to +1 or -1 the stronger the linear relationship. The correlation coefficient is a measure of the mutual relationship between two variables.

The latter portion of this report will deal with the month prenatal care began and the number of prenatal visits correlated to complications of pregnancy as shown in Tables Three and Four.

According to the National Institute of Child Health and Human Development, "approximately 20 percent of all women in the U.S. who become pregnant have one or more health problems serious enough to complicate pregnancy and place the unborn child in jeopardy."[1] One out of every 4.9 New Hampshire resident live births had some sort of complication reported on the birth certificate: this represents 20.6 percent of all resident live births.

For mothers having eight visits or less, twenty-two percent of their births had complications while for those mothers having more than eight visits, twenty percent of their births had complications. This difference is significant at P.054; i.e., the probability of this occurring by chance alone is 5.4 in 100. The relationship between the number of prenatal visits and combination of complications without mention of birth injury and/or congenital malformation is inverse, that is, a fewer percentage of complications are observed as the number of prenatal visits increases ($r = -.808$). The association between the number of prenatal visits and all complications is also inverse ($r = -.632$).

The relationship between the month prenatal care began and all complications is inverse but the correlation coefficient is weak ($r = -.579$). Further, the relationship between the month prenatal care began and combination of complications without mention of birth injury and/or congenital malformation is also inverse with an even weaker association ($r = -.368$). One possible interpretation of this relationship is that high risk mothers or those with a previous history of problems with an infant start their prenatal care early. Because it is difficult to educe a principle to encompass the above relationship and because it is out of the purview of this report, possible reasons for this phenomenon merit further investigation.

It is important to note that it is impossible to compute causality. We can merely observe that the degree of association between the variables is strong or weak and that the interrelationships are complex. "Remember also that convincing evidence of an association, even though close, does not prove that X is the cause of the variation in Y. Evidence of causality must come from other sources."[2]

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NOTE: A detailed breakdown of trimester prenatal care began by counties, and cities/towns for 1976 New Hampshire resident live births is available upon request.

Jan. 9,1978

FIGURE 1

PERCENT DISTRIBUTION OF LIVE BIRTHS
BY MONTH PRENATAL CARE BEGAN:

NEW HAMPSHIRE 1976

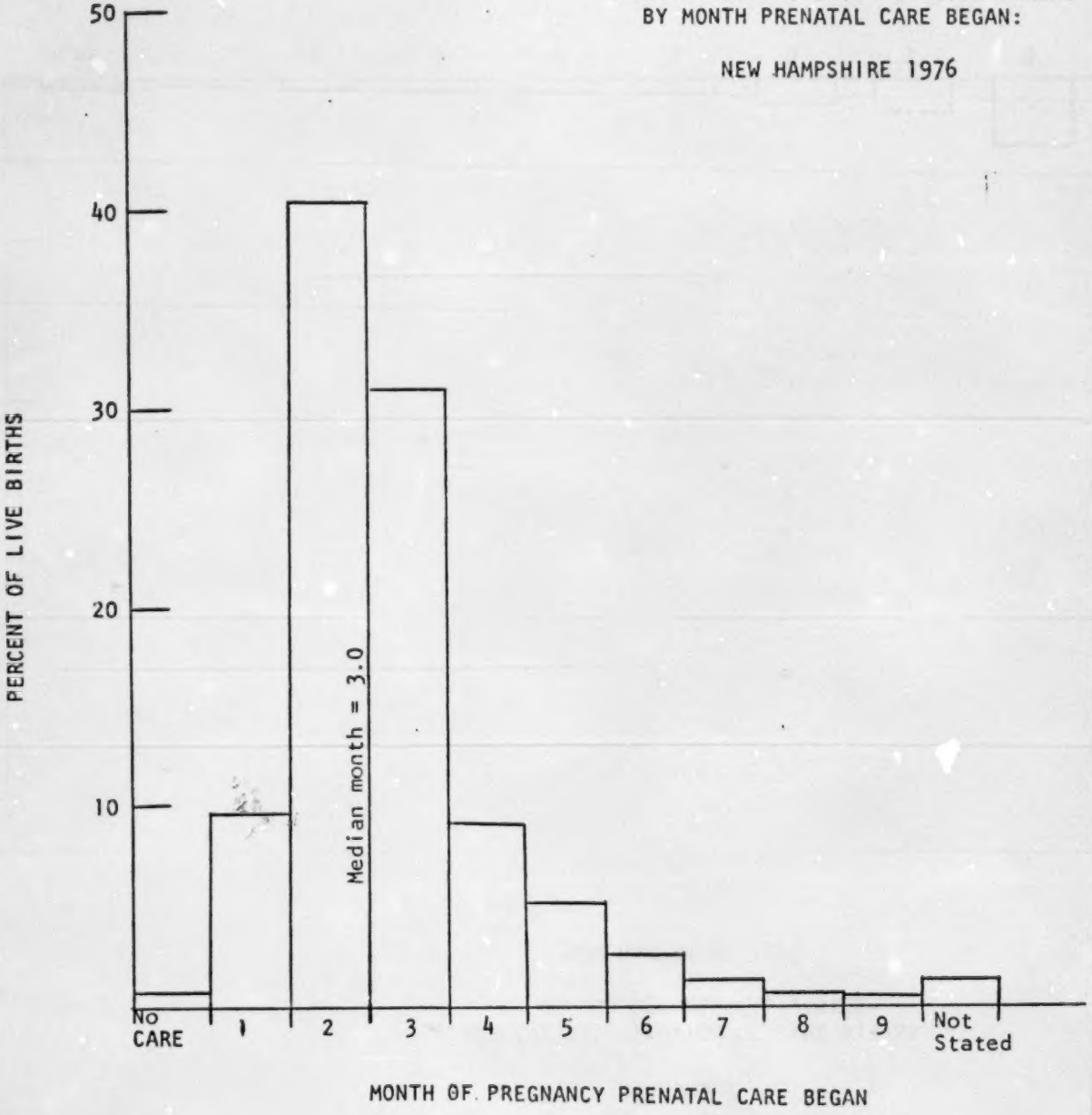
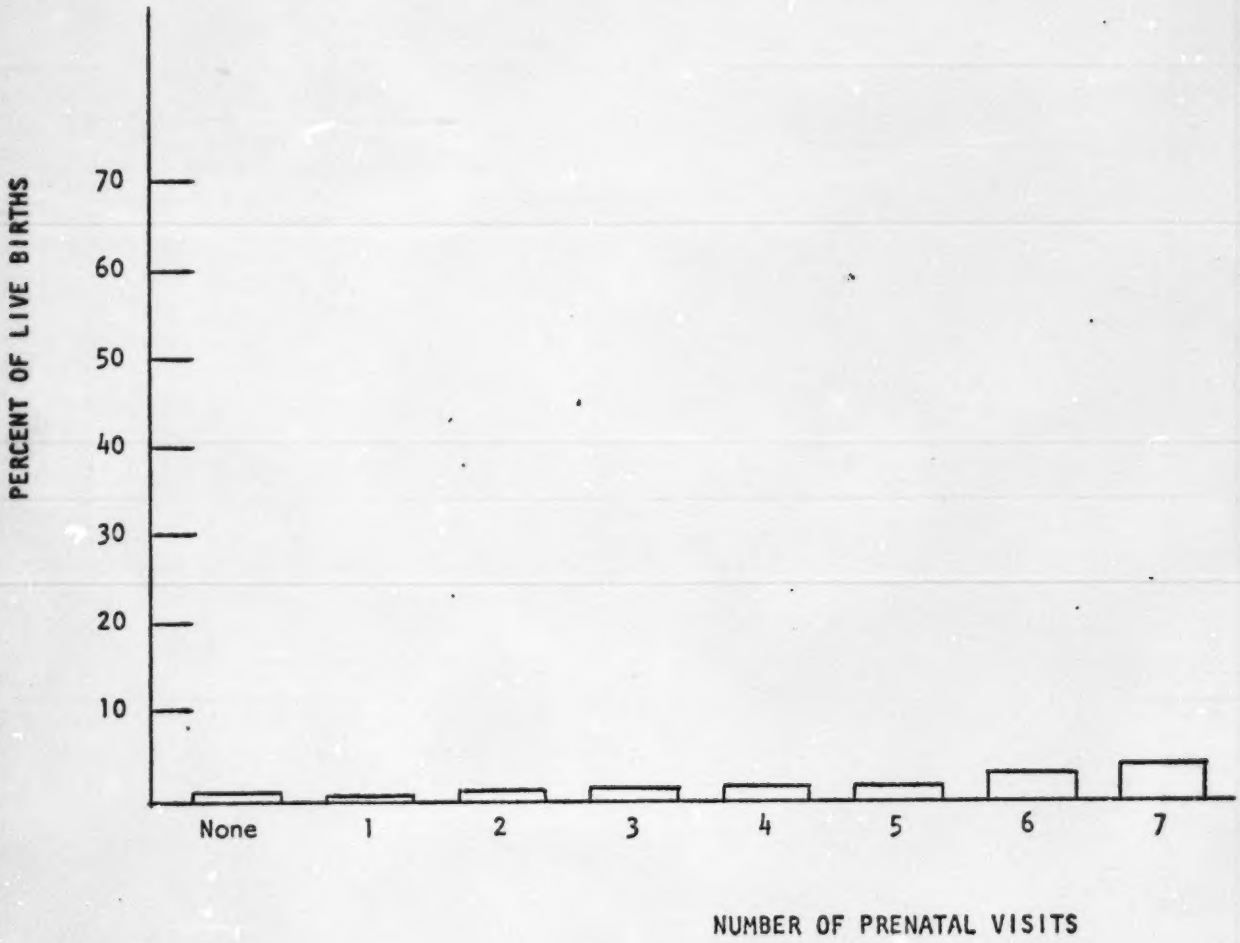


FIGURE 2

PERCENT DISTRIBUTION OF LIVE BIRTHS
BY NUMBER OF PRENATAL VISITS:

NEW HAMPSHIRE 1976



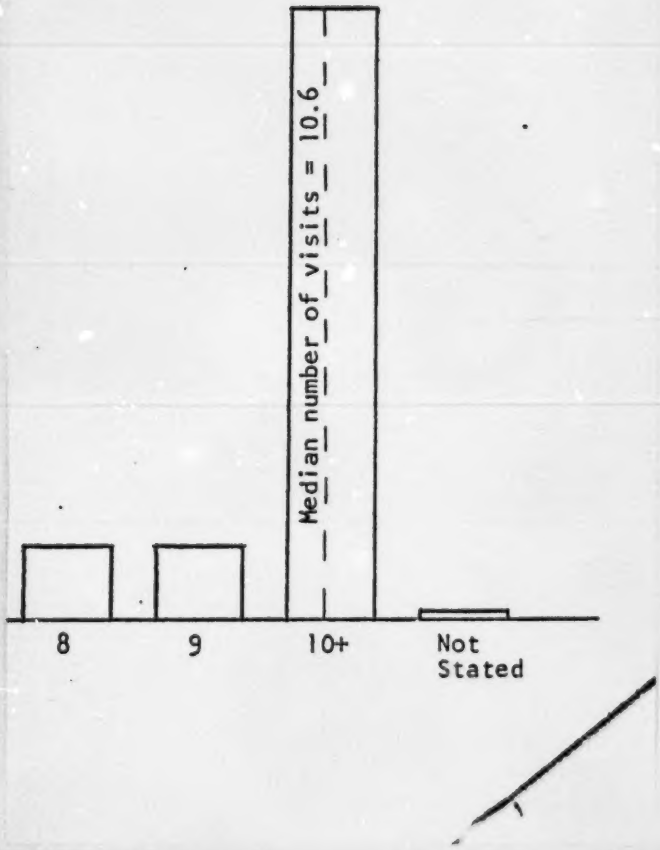

Median number of visits = 10.6
8
9
10+
Not
Stated

TABLE 1

MONTH PRENATAL CARE BEGAN BY SELECTED CHARACTERISTICS
NEW HAMPSHIRE RESIDENTS - 1976

(Numbers in Parenthesis represent percentages of live births for

MONTH PRENATAL CARE BEGAN	LIVE BIRTHS	LOW BIRTH WEIGHT <2500 gms.	ILLEGITIMATE	MATERNAL AGE 18 & UNDER	MATERNAL AGE 19 & UNDER
First	1,044	88 *(8.4%)*	44 *(4.2%)*	35 *(3.4%)*	83 *(8.0%)*
Second	4,506	233 *(5.2)*	204 *(4.5)*	192 *(4.3)*	355 *(7.9)*
Third	3,464	212 *(6.1)*	256 *(7.4)*	278 *(8.0)*	485 *(14.0)*
Fourth	989	62 *(6.3)*	137 *(13.9)*	157 *(15.9)*	224 *(22.6)*
Fifth	496	48 *(9.7)*	104 *(21.0)*	108 *(21.8)*	144 *(29.0)*
Sixth	250	10 *(4.0)*	71 *(28.4)*	70 *(28.0)*	90 *(36.0)*
Seventh	146	13 *(8.9)*	49 *(33.6)*	45 *(30.8)*	59 *(40.4)*
Eighth	60	4 *(6.7)*	22 *(36.7)*	14 *(23.3)*	20 *(33.3)*
Ninth	38	5 *(13.2)*	14 *(36.8)*	6 *(15.8)*	11 *(28.9)*
No Prenatal Care	32	8 *(25.0)*	16 *(50.0)*	8 *(25.0)*	13 *(40.6)*
Not stated	161	18 *(11.2)*	29 *(18.0)*	21 *(13.0)*	25 *(15.5)*
TOTAL:	11,186	701 *(6.3)*	946 *(8.5)*	934 *(8.3)*	1,509 *(13.5)*

Median month prenatal care began = 3.0

specified month)

MATERNAL EDUCATION UNDER 12	MATERNAL EDUCATION OVER 12	CONG.MALF.& BTH. INJ.
168 *(16.1%)*	392 *(37.5%)*	14 *(1.3%)*
727 *(16.1)*	1,646 *(36.5)*	75 *(1.7)*
712 *(20.6)*	1,133 *(32.7)*	63 *(1.8)*
295 *(29.8)*	259 *(26.2)*	25 *(2.5)*
184 *(37.1)*	100 *(20.2)*	19 *(3.8)*
110 *(44.0)*	50 *(20.0)*	6 *(2.4)*
77 *(52.7)*	26 *(17.8)*	2 *(1.4)*
27 *(45.0)*	9 *(15.0)*	1 *(1.7)*
10 *(26.3)*	13 *(34.2)*	1 *(2.6)*
18 *(56.3)*	3 *(9.4)*	2 *(6.3)*
52 *(32.3)*	43 *(26.7)*	8 *(5.0)*
2,380 *(21.3)*	3,674 *(32.8)*	216 *(1.9)*

TABLE 2

NUMBER OF PRENATAL VISITS BY SELECTED CHARACTERISTICS
NEW HAMPSHIRE RESIDENTS - 1976

(Percent of Live Births for Specified Number of Visits in

NUMBER PRENATAL VISITS	LIVE BIRTHS	LOW BIRTH WEIGHT <2500 gms.	ILLEGITIMATE	MATERNAL AGE 18 & UNDER	MATERNAL AGE 19 & UNDER
NONE	32	8 *(25%)*	16 *(50%)*	8 *(25.0%)*	13 *(40.6%)*
1	30	7 *(23.3)*	16 *(53.3)*	8 *(26.7)*	11 *(36.7)*
2	47	10 *(21.3)*	10 *(21.3)*	6 *(12.8)*	12 *(25.5)*
3	96	19 *(19.8)*	24 *(25.0)*	25 *(26.0)*	35 *(36.5)*
4	123	36 *(29.3)*	37 *(30.1)*	21 *(17.1)*	31 *(25.2)*
5	215	51 *(23.7)*	55 *(25.6)*	44 *(20.5)*	58 *(27.0)*
6	357	47 *(13.2)*	63 *(17.6)*	69 *(19.3)*	97 *(27.2)*
7	476	65 *(13.7)*	59 *(12.4)*	67 *(14.1)*	96 *(20.2)*
8	932	93 *(10.0)*	90 *(9.7)*	103 *(11.1)*	151 *(16.2)*
9	932	66 *(7.1)*	84 *(9.0)*	82 *(8.8)*	147 *(15.8)*
10 & over	7,766	273 *(3.5)*	464 *(6.0)*	478 *(6.2)*	830 *(10.7)*
Not Stated	180	26 *(14.4)*	28 *(15.6)*	23 *(12.8)*	28 *(15.6)*
TOTAL:	11,186	701 *(6.3)*	946 *(8.5)*	934 *(8.3)*	1,509 *(13.5)*

Median number of visits = 10.6

Parenthesis)

MATERNAL EDUCATION		CONG.MALF.&
UNDER 12	OVER 12	BTH.INJ.
18 *(56.3%)*	3 *(9.4%)*	2 *(6.3%)*
15 *(50.0)*	3 *(10.0)*	1 *(3.3)*
18 *(38.3)*	11 *(23.4)*	1 *(2.1)*
42 *(43.8)*	11 *(11.5)*	1 *(1.0)*
54 *(43.9)*	21 *(17.1)*	7 *(5.7)*
92 *(42.8)*	42 *(19.5)*	4 *(1.9)*
130 *(36.4)*	70 *(19.6)*	10 *(2.8)*
139 *(29.2)*	144 *(30.3)*	11 *(2.3)*
215 *(23.1)*	264 *(28.3)*	25 *(2.7)*
211 *(22.6)*	289 *(31.0)*	12 *(1.3)*
1,391 *(17.9)*	2,773 *(35.7)*	133 *(1.7)*
55 *(30.6)*	43 *(23.9)*	9 *(5.0)*
2,380 *(21.3)*	3,674 *(32.8)*	216 *(1.9)*

TABLE 3

MONTH PRENATAL CARE BEGAN BY SELECTED COMPLICATIONS
NEW HAMPSHIRE RESIDENTS - 1976

(Numbers in Parenthesis Represent Percentages of Live

MO. PRENATAL CARE BEGAN	LIVE BIRTHS	COMPLICATIONS RELATED TO PREGNANCY	COMPLICATIONS NOT RELATED TO PREGNANCY	COMPLIC. OF LABOR AND DELIVERY TO MOTHER
First	1,044	29 (2.8%)	15 (1.4%)	34 (3.3%)
Second	4,506	128 (2.8)	86 (1.9)	121 (2.7)
Third	3,464	131 (3.8)	49 (1.4)	99 (2.9)
Fourth	989	42 (4.2)	18 (1.8)	29 (2.9)
Fifth	496	23 (4.6)	6 (1.2)	10 (2.0)
Sixth	250	6 (2.4)	2 (0.8)	6 (2.4)
Seventh	146	9 (6.2)	2 (1.4)	1 (0.7)
Eighth	60	2 (3.3)	2 (3.3)	0 (0)
Ninth	38	2 (5.3)	0 (0)	0 (0)
No Prenatal Care	32	3 (9.4)	0 (0)	0 (0)
Not Stated	161	6 (3.7)	3 (1.9)	2 (1.2)
TOTAL:	11,186	381 (3.4)	183 (1.6)	302 (2.7)

Births for Specified Month)

COMPLIC. OF LABOR AND DELIVERY TO CHILD		COMBIN. OF COMPLIC. w/o MENT.OF BTH.INJ. AND/OR CONG.MALFORM.		ALL COMPLICS.	
22	(2.1%)	149	(14.3%)	249	(23.9%)
88	(2.0)	507	(11.3)	930	(20.6)
79	(2.3)	338	(9.8)	696	(20.1)
21	(2.1)	94	(9.5)	204	(20.6)
11	(2.2)	46	(9.3)	96	(19.4)
2	(0.8)	17	(6.8)	33	(13.2)
4	(2.7)	16	(11.0)	32	(21.9)
2	(3.3)	3	(5.0)	9	(15.0)
0	(0)	5	(13.2)	7	(18.4)
1	(3.1)	5	(15.6)	9	(28.1)
4	(2.5)	20	(12.4)	35	(21.7)
234	(2.1)	1,200	(10.7)	2,300	(20.6)

TABLE 4

NUMBER OF PRENATAL VISITS BY SELECTED COMPLICATIONS
NEW HAMPSHIRE RESIDENTS - 1976

(Percent of Live Births for Specified Number of Visits in Parenthesis)

NUMBER PRENATAL VISITS	LIVE BIRTHS	COMPLICATIONS RELATED TO PREGNANCY	COMPLICATIONS NOT RELATED TO PREGNANCY	COMPLIC. OF LABOR AND DELIVERY TO MOTHER	COMPLIC. OF LABOR AND DELIVERY TO CHILD
None	32	3 (9.4%)	0 (0%)	0 (0%)	1 (3.1%)
1	30	0 (0)	0 (0)	0 (0)	1 (3.3)
2	47	4 (8.5)	1 (2.1)	1 (2.1)	0 (0)
3	96	9 (9.4)	3 (3.1)	1 (1.0)	1 (1.0)
4	123	6 (4.9)	1 (0.8)	2 (1.6)	2 (1.6)
5	215	12 (5.6)	3 (1.4)	3 (1.4)	8 (3.7)
6	357	15 (4.2)	5 (1.4)	8 (2.2)	11 (3.1)
7	476	21 (4.4)	5 (1.1)	11 (2.3)	7 (1.5)
8	932	34 (3.6)	14 (1.5)	19 (2.0)	15 (1.6)
9	932	28 (3.0)	6 (0.6)	22 (2.4)	21 (2.3)
10 & over	7766	238 (3.1)	143 (1.8)	233 (3.0)	162 (2.1)
Not stated	180	11 (6.1)	2 (1.1)	2 (1.1)	5 (2.8)
TOTAL:	11,186	381 (3.4)	183 (1.6)	302 (2.7)	234 (2.1)

COMBIN. OF COMPLIC. w/o MENT.OF BTH.INJ. AND/OR CONG.MALFORM.		ALL COMPLICATIONS	
5	(15.6%)	9	(28.1%)
5	(16.7)	6	(20.0)
6	(12.8)	12	(25.5)
14	(14.6)	28	(29.2)
20	(16.3)	31	(25.2)
33	(15.3)	59	(27.4)
41	(11.5)	80	(22.4)
58	(12.2)	102	(21.4)
98	(10.5)	180	(19.3)
85	(9,1)	162	(17.4)
812	(10.5)	1588	(20.4)
23	(12.8)	43	(23.9)
1,200	(10.7)	2,300	(20.6)

APPENDIX A

To help you acquire some experience of the nature of r, a number of simple tables with the corresponding graphs are displayed in figure 7.2.1. In each of these tables $n = 9$, $\bar{X}_1 = 12$, $\bar{X}_2 = 6$, $\Sigma x_1^2 = 576$, $\Sigma x_2^2 = 144$. Only $\Sigma x_1 x_2$ changes, and with it the value of r. Since $\sqrt{(\Sigma x_1^2)(\Sigma x_2^2)} = \sqrt{(576)(144)} = 288$, the correlation is easily evaluated in the several tables by calculating $\Sigma x_1 x_2$ and dividing by 288 (or multiplying by $1/288 = 0.0034722\ldots$ if a machine is used).

In *A*, the nine points lie on a straight line, the condition for $r = 1$.

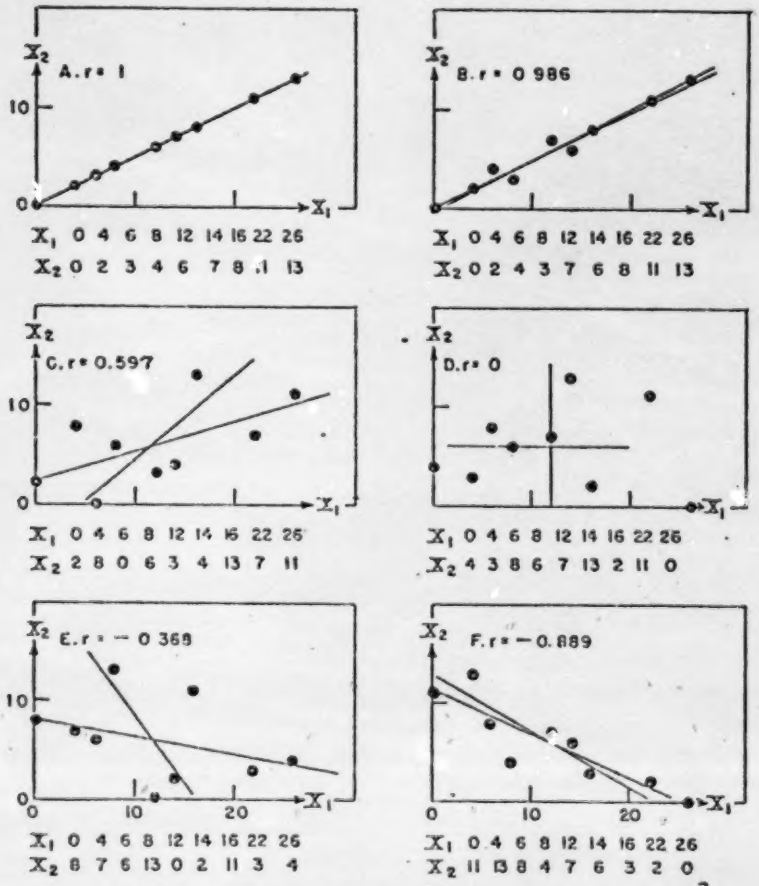


FIG. 7.2.1—Scatter diagrams with correlations ranging from 1 to −0.889.[3]

To plot the data from this report, the Y or vertical axis should represent the month prenatal care began or the number of prenatal visits while the X or horizontal axis should represent the percent of selected characteristics or complications.

FOOTNOTES

1. Little Babies Born Too Soon, Born Too Small, National Institute of Child Health and Human Development, 1977 p.7.

2. G.W.Snedecor and W.G.Cochran, Statistical Methods, Sixth Edition, 1976, p.177.

3. Ibid, p.174.

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